April 29, 1969

F. W. HELD

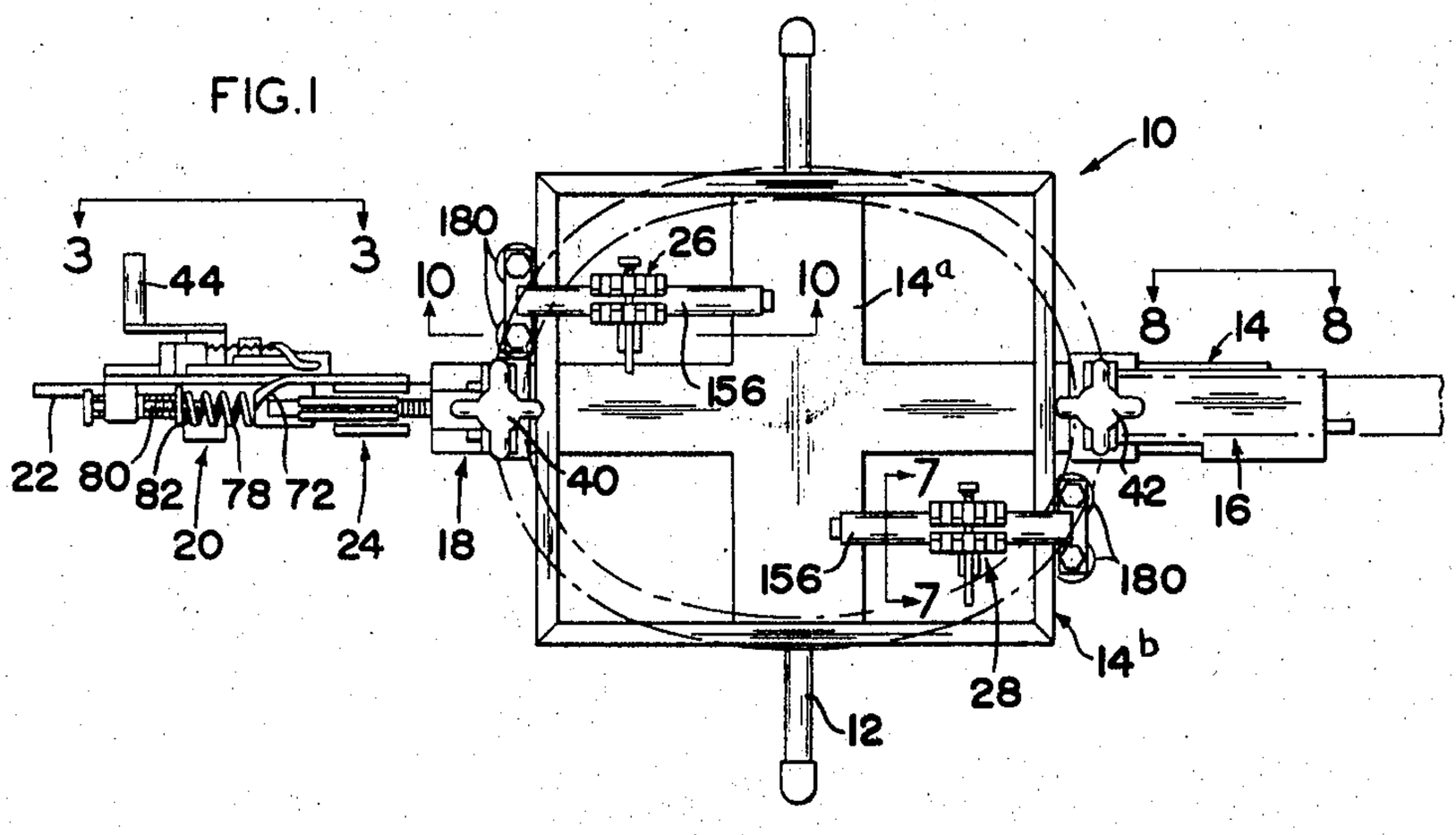
RACKET STRINGER

3,441,275

Filed March 3, 1967

Sheet 1 of 2

FIG.1



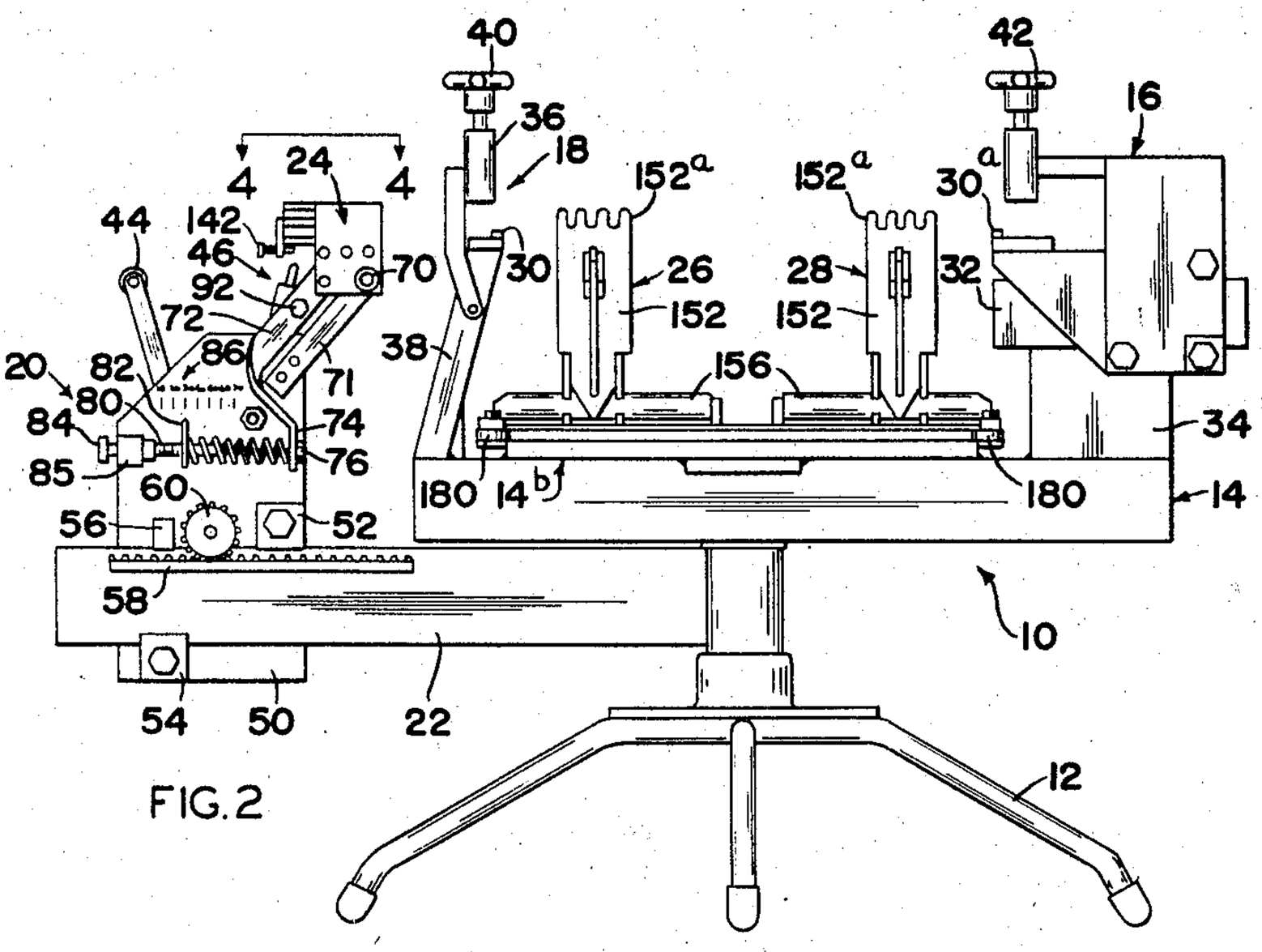


FIG.2

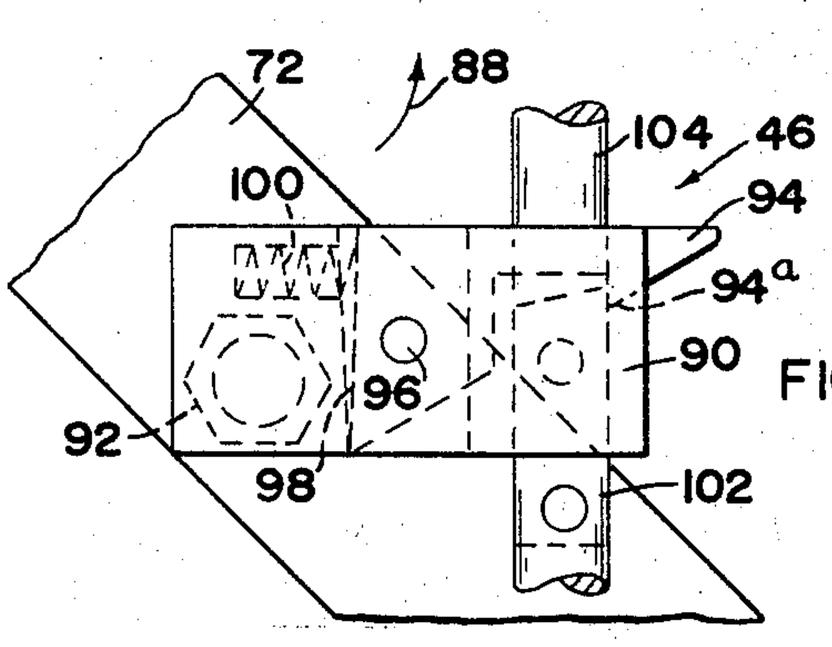


FIG.11

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Sheet 2 of 2

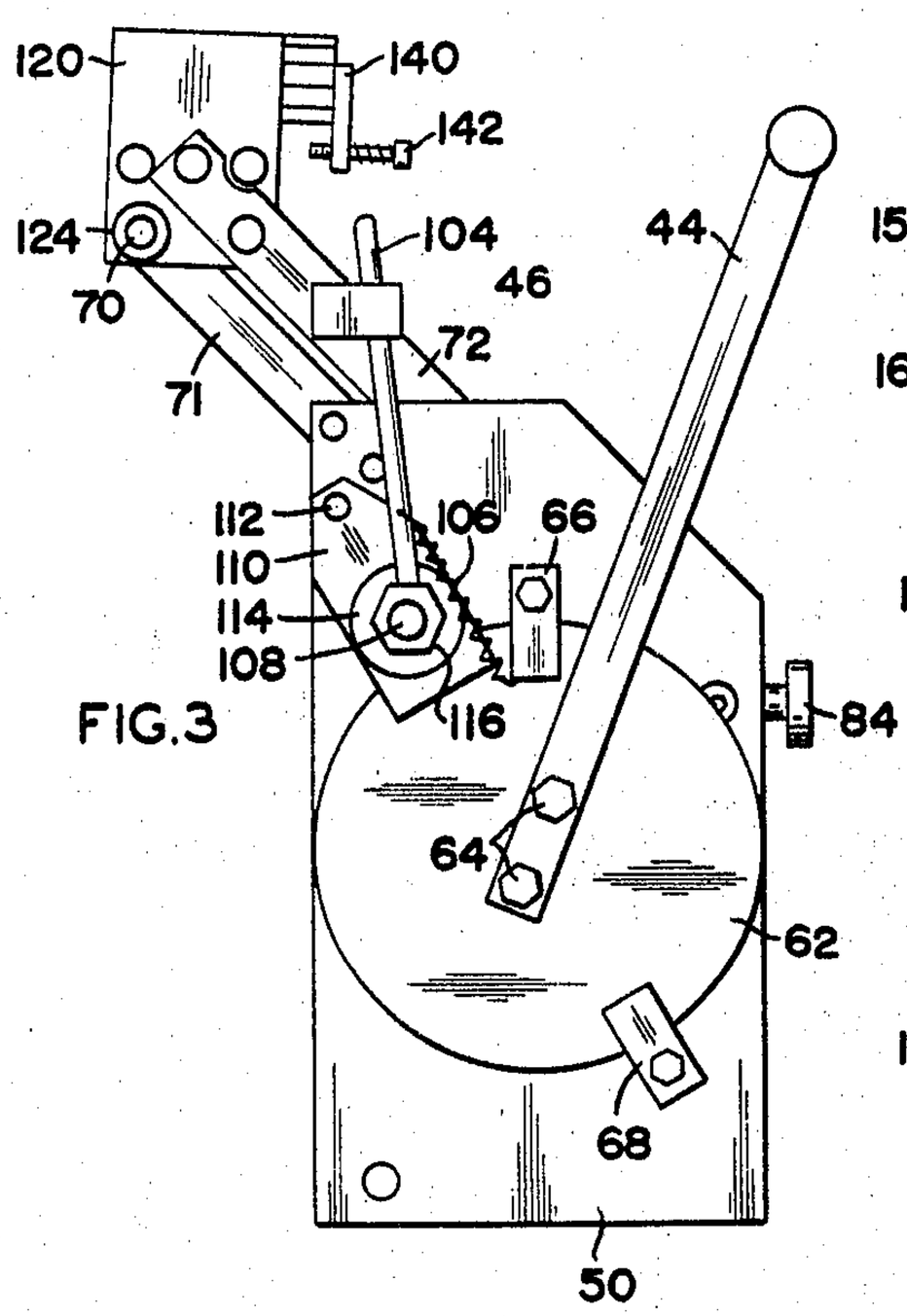


FIG. 3

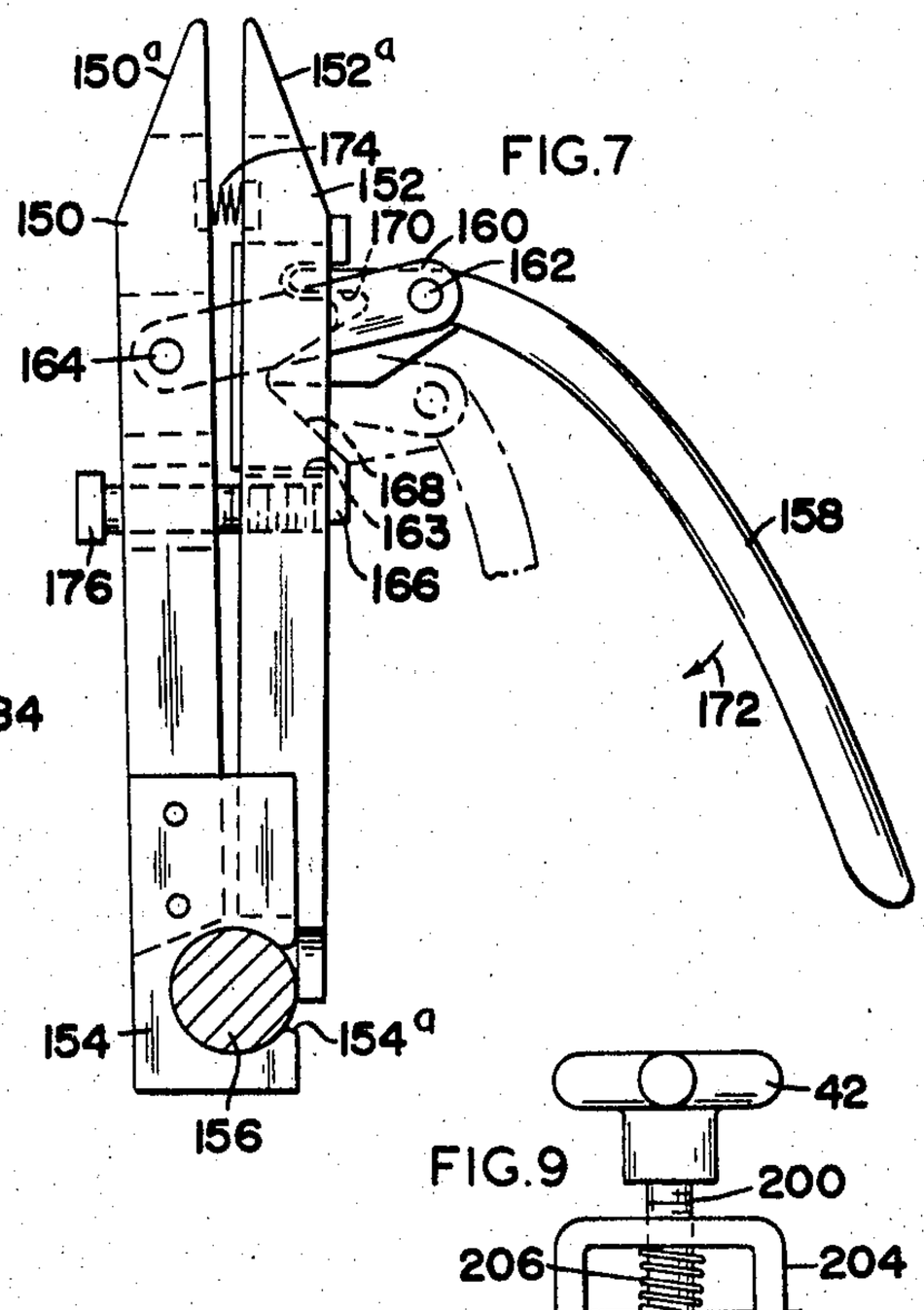


FIG. 7

FIG. 9

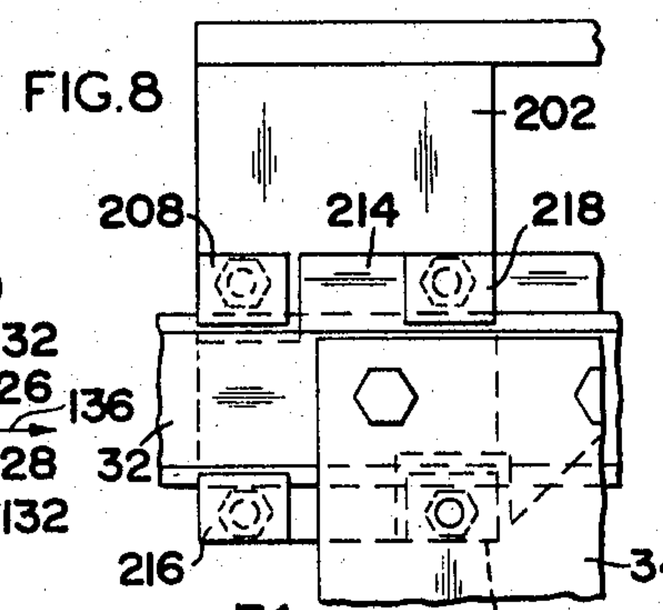


FIG. 8

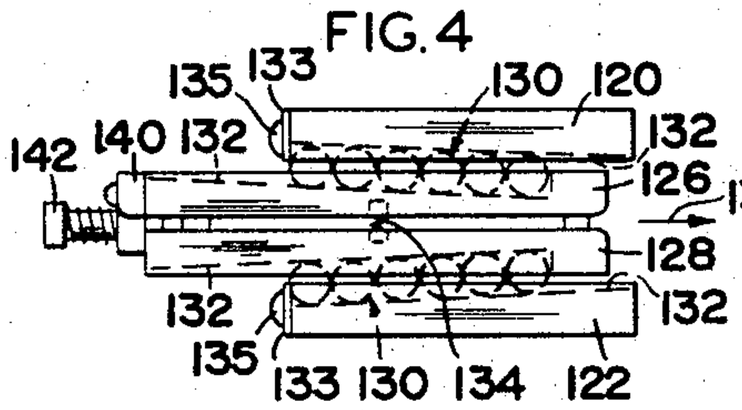


FIG. 4

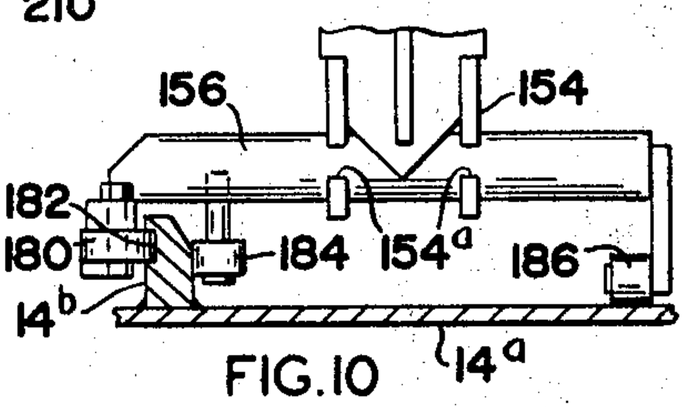


FIG. 10

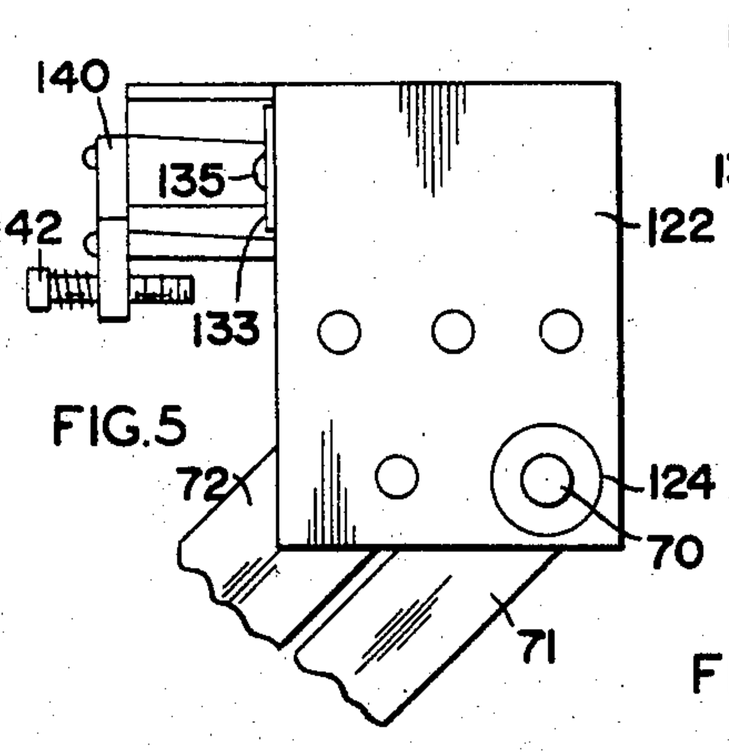


FIG. 5

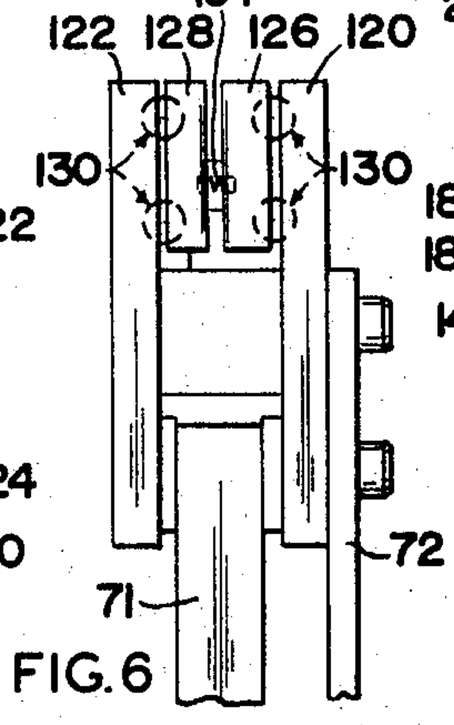


FIG. 6

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RACKET STRINGER

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Int. Cl. A63b 51/14
U.S. Cl. 273—73
10 Claims

ABSTRACT OF THE DISCLOSURE

A racket stringer having a racket clamping frame mounted on a base for rotation about a vertical axis. A tension head is slidably mounted on the base for movement toward or away from the racket clamping frame. The tension head pivotally carries a string clamp head. The string clamp head is spring-biassed to pivot away from the clamping frame. The biassing spring can be adjusted to control the tension in the racket string. When the racket string reaches a predetermined tension, the tension head is automatically braked against further movement relative to the racket clamping frame.

Prior art

Heretofore it has been known that there have been many and various types of machines and apparatus for stringing rackets such as those shown, for example, in U.S. Patents Nos. 2,389,609, 2,971,760 and 2,100,948. However, none of these patents utilize a tensioning mechanism which automatically provides the desired tension by a simple manual rotation of a crank and when the desired tension is reached without any knowledge or skill of the operator, the tensioning mechanism is locked into position to permit engagement of the clamps with the strings to hold the string under tension and in position. None of these prior art mechanisms utilize such a tensioning device to take all of the guess work and human error out of the operation of the equipment. Further, the prior art has not recognized fully the problem inherent in clamping the strings. Namely, that the clamping of the strings must be sufficient to firmly hold the strings, but not so hard as to crush and damage them. The above identified prior art and other patents such as Patent Nos. 2,131,880 and 2,262,110 do not control the amount of clamping pressure onto the strings in a positive manner so as to eliminate crushing.

It is the general object of the present invention to overcome the inherent difficulties of and objections to the prior art in racket stringing apparatus by providing an apparatus which automatically achieves the proper tension and holds it while the strings are clamped and held in position, and wherein all clamps utilized for holding the string are actuated only sufficiently to firmly hold, but not crush the strings in the racket.

A further object of the invention is to provide a racket stringer which is adjustable for rackets of different size, and wherein the stringing can be quickly and positively accomplished by the ability to change the tensioning head with respect to the racket being held, and at the same time change the string clamping mechanism.

A further object of the invention is to provide a simple, highly reliable, yet inexpensive racket stringer which may be portable, and which is adjustable to be utilized for rackets of various size and strings of various size associated with the rackets.

The aforesaid objects of the invention and other objects which will become apparent as the description proceeds are achieved by providing in a device for stringing tennis rackets and the like, a base, a substantially square and planar support frame mounted to the base, an elongated tensioning arm mounted to the base so as to be pivotal around the support frame in a plane substantially parallel thereto, clamp means mounted to the support frame to hold a racket in fixed relation thereto, at least one string clamp carried on the frame and slidable substantially parallel to at least one edge thereof which is characterized by a tension head carried in substantially longitudinal sliding relation on the tension arm, a string clamp head mounted for limited pivotal movement to the tension head and adapted to clamp and hold a string to be tightened, tension means normally biasing the string clamp head to one limit of its pivotal movement, means to move the tension head along the tensioning arm to tighten a string held by the string clamp head, and locking means actuated by a preselected amount of pivotal movement of the string clamp head toward its other limit to lock the tension head in fixed relation to the tensioning arm.

Description of the drawings

For a better understanding of the invention reference should be had to the accompanying drawings wherein:

FIGURE 1 is a plan view of the apparatus comprising a preferred embodiment of the invention;

FIGURE 2 is a side elevation of the apparatus of FIGURE 1;

FIGURE 3 is a side elevation of the tension head assembly taken substantially in a direction illustrated by line **3—3** in FIGURE 1;

FIGURE 4 is a plan view of the tension string clamp head associated with the tension head assembly taken in a direction indicated by line **4—4** in FIGURE 2;

FIGURE 5 is a side elevational illustration of the clamp head of FIGURE 4;

FIGURE 6 is an end elevational illustration of the clamp head of FIGURES 4 and 5;

FIGURE 7 is an end elevational illustration of the string clamp mounted to the frame, and taken on line **7—7** of FIGURE 1;

FIGURE 8 is a broken away side elevation of the sliding and clamping arrangement associated with the movable racket holding member taken from line **8—8** of FIGURE 1;

FIGURE 9 is an enlarged cross sectional and elevational view of the sliding clamping mechanism of FIGURE 8 taken from the right end thereof, but with the clamp handle shown in FIGURE 1 added thereto;

FIGURE 10 is a cross sectional side elevation illustrating the relationship of the sliding clamp bar to the frame carrying the string clamp as taken on line **10—10** of FIGURE 1; and

FIGURE 11 is an enlarged broken away illustration of the latch catch providing for locking of the tension head assembly.

Description of the invention

With reference to the form of the invention illustrated in FIGURES 1 and 2 of the drawings, the numeral **10** indicates generally a racket stringer particularly for tennis rackets, or the like, comprising a base **12** which in this instance is illustrated as portably mounting on a table top, or the like, but which could be a fixed or bolted base, as selectively desired. A substantially square and planar support frame **14** is mounted to the base **12**, and preferably is in rotatable relationship thereto. The frame **14** mounts a substantially square rail **14***b* centrally thereof. The racket to be strung indicated in dotted lines in FIGURE 1 is held to frame **14** by integral clamp units indicated generally by numerals **16** and **18**, respectively. These units will be described more fully hereinafter. Normally, the tip of the racket is held in clamp unit **18** while the throat is held at clamp unit **16**. Actual tensioning is pro-

vided by a tension head assembly indicated generally by numeral **20** which is slidable on a tensioning arm **22**. The arm **22** is fixedly mounted to the post supporting frame **14** to base **12**, as most clearly shown in FIGURE 2 of the drawings. A string clamp head, indicated generally by numeral **24**, is pivotally mounted to the tension head assembly **20** and actually clamps and holds the string to be tensioned by the movement of tension head assembly **24** in the proper direction along arm **22**. The details of these components will be more fully described hereinafter. Once the string has been tensioned, it can be then fully retained in its tensioned position by the appropriate one of separate string clamps, each indicated generally by numerals **26** and **28**, respectively.

In order to position a racket in the assembly, the throat of the racket is laid onto the table or support formed by clamp unit **16** with the tip of the frame just fitting over a raised lip **30** carried on the top of support bracket **38**, as best seen in FIGURE 2. Once the tip of the racket is in position over raised flange **30**, a pressure head **36** pivotally mounted to a support bracket **38** secured to an extension of frame **14** is pivoted up and tightened into position as by handle **40** to hold the tip of the racket in position. At this time, unit **16** which is slidable on a rail **32** carried by a mounting flange **34** is moved along rail **32** to the right as seen in FIGURE 2 until its lip **30***a* comes into engagement with the racket frame at the throat thereof. At this time, the handle **42** is tightened down to hold the throat in position. The structure of unit **16** is such that the tightening of handle **42** also automatically locks the unit into fixed relationship with the rail **32**. A more detailed description of this structure will follow. In any event, it should be understood that the racket is now in position for stringing.

Stringing is accomplished by engaging the string to be tightened in the string clamp head **24**, and pulling it to the desired tension by rotating a handle **44** to move the tension head **20** towards the left, as seen in FIGURE 2 until the automatic tensioning mechanism, to be more fully defined hereinafter, causes pivotal movement of clamp head **24** so as to release a catch assembly indicated generally by numeral **46**, thereby locking tension head assembly **20** in fixed relationship to arm **22**. At this point one of the string clamps **26** is moved into position adjacent the racket frame and clamps onto the string that is tensioned. The clamping action of either unit **26** or **28** automatically locks it with respect to frame **14** and maintains the tension on the string to allow release by clamp head **24**, a pivot of the entire frame **14** around to allow assembly **20** to grasp and pull the string in the opposite direction for the next tensioning operation. Naturally, upon the next tensioning, the string clamp will be utilized on the opposite side of the racket frame in the same manner described above. This procedure is followed until all the strings in one direction of the frame have been strung, and then the string clamps **26** and **28** are moved to the other parallel sides of frame **14**, from that shown in FIGURE 1, as will be more fully defined hereinafter, so that the strings in perpendicular or transverse relationship can be strung and tensioned. Thus, it can be seen that the operation of the device is very quick, highly reliable, and very simple.

In some instances it is desirable to use three string clamps. The long strings are normally put in first, starting from the center and stringing both ways toward the edges of the frame. Since the string is not tied to the frame at the center, some sort of a clamp is required to hold the string where it might otherwise have been tied to the frame. This sort of operation can best be accomplished with the arrangement I have, by using one clamp to hold the string at the center while working one end of it back and forth toward one edge of the frame with the other two clamps as described above.

It is possible to accomplish this sort of stringing with two clamps by providing in addition to the two clamps

and two short clamp bars, one long clamp bar which reaches all the way across the long length of the rectangle formed by the rail **14***b* and having bearings which ride in the grooves of the opposite rails of the rectangle. This way one clamp on a short bar can be used to hold the string in the center while the other can be placed on the long bar, which can take tension and moment in either direction, and can be slid alternately from one side to the other to hold the string which is being tightened alternately in one direction then in the other toward one edge of the frame. As soon as three or four strings are in place from the center toward one edge of the frame, then the clamps can be interchanged without loosing any of the tension if the tension head is properly utilized. Then the long bar can be used to carry its clamp back and forth so as to hold the strings which are being tensioned from the center toward the other edge of the frame. Stringing is started from the center and worked both ways in order to avoid pulling the racket frame out of shape.

The specific construction of the component features of the invention will be more fully described hereinbelow, now that it is understood exactly how each component functions in the overall combination.

Tension head assembly

The details of the tension head assembly **20** are best shown with relation to FIGURES 2 and 3 of the drawings, and essentially it comprises a carrying plate **50** which is slidably mounted with respect to arm **22** by guide blocks **52** and **54** removably mounted to plate **50** by appropriate bolts, and which extend slightly around the edge portion of arm **22**, as best indicated in FIGURE 2 of the drawings. Also, to make the sliding movement of plate **50** on arm **22** easier, a permanent guide **56** mounted to plate **50** is provided. The actual movement of plate **50** with respect to arm **22** is achieved by a rack **58** appropriately mounted in fixed relationship to the arm **22** and a gear **60** rotatively driven by the fixed connection of handle **44** thereto. Essentially, as best seen in FIGURE 3, the handle **44** connects directly to a large circular disc **62** by appropriate bolts **64** with the disc **62** actually connected in direct locked relationship through an appropriate shaft rotatably passing through plate **50** and connected to gear **60**. The disc **62** is held in adjacent rotatable relationship with respect to plate **50** by a pair of brackets **66** and **68** mounted to plate **50** by appropriate bolts, as best seen in FIGURE 3 of the drawings.

The tensioning string clamp head **24** is mounted on a pivot pin **70** to a fixed bracket **71** carried by plate **50** and extending at an upwardly and outwardly directed angle thereto so as to position head **24** above and laterally toward the racket to be strung. The head **24** is limited, however, in its pivotal movement by an actuating bracket arm **72** affixed thereto and extending with appropriate curved configuration, as best seen in FIGURE 2 of the drawings, until a flat short end portion **74** is substantially parallel and closely spaced to the edge of one vertical side of plate **50**. This end portion **74** engages against a stop **76** mounted to plate **50** to limit the pivotal movement of head **24** in a counter-clockwise direction so that head **24** in this limited relationship which is the normal untensioned position is normally tipped slightly back as seen in FIGURE 3, and under tension tips forward to a substantially square position whenever **104** is released.

Pivotal movement of head **24** in the opposite or clockwise direction to drive end portion **74** to the left, as seen in FIGURE 2, is controlled by the amount of spring pressure or permanent bias applied by a helical coiled compression spring **78** carried by a plunger **80**. The plunger **80** is rotatably received in non-sliding relationship in a bracket **85** mounted to plate **50**. A spring pressure regulating stop **82** is threadably received on shaft **80** whereby rotation of shaft **80** by handle **84** causes stop **82** to move to the left or right to thereby control the compression of spring **78**, and hence the degree of force necessary to

cause pivotal action of clamp head **24** to the right or clockwise to force end portion **74** of bracket arm **72** to compress the spring **78**. A scale, indicated generally by numeral **86**, is printed on or mounted to plate **50** in relation to stop **82** so that the position of stop **82** with respect to the scale will indicate the amount of string tension that will cause pivotal action of clamp head **24** necessary to cause actuation of catch **46**.

The actuation of catch **46** is most clearly shown with reference to FIGURE 11. When the desired string tension is reached the entire catch assembly **46** being fixedly mounted to the bracket arm **72** rotates upwardly, or in a direction indicated by an arrow **88** in FIGURE 11. The catch **46** usually comprises a plate **90** fixedly mounted to bracket **72** by a suitable bolt **92** from the opposite side thereof. A catch plate **94** is pivotally mounted to plate **90** by a pin **96** with its degree of pivotal movement being quite small and limited by its base engaging against a flush internal edge **98** of plate **90**. A spring **100** is provided to normally bias catch plate **94** in a clockwise or downward direction as seen in FIGURE 11. Catch plate **94** has a lip **94***a* which is adapted to hook over the end of a flat bar **102** which is riveted to a lever **104**. Thus, it is seen that when clamp head **24** rotates in a direction indicated by arrow **88** in FIGURE 11, the lip **94***a* of catch plate **94** slips over the end of bar **102** thereby releasing lever **104**. Lever **104** is biased upon such release to rotate in a clockwise direction by a suitable spring **106**, as best seen in FIGURE 3. The clockwise rotation of lever **104** rotates a nut **116** threadably received on a shaft **108** which is mounted in fixed relation by plate **50** so as to press a brake wedge **110**, all as seen in FIGURE 3, into a pressured relationship against disc **62** thereby in effect locking disc **62** into fixed relationship to plate **50**. The threaded relationship of nut **116** with respect to shaft **108** is such that a very small arcuate rotation of lever **104** achieves the desired locking action of disc **62**. The wedge **110** is somewhat slidably and somewhat pivotally mounted at its upper end by a pin **112** to plate **50** so that it will remain in a substantially parallel slightly pivotal position with respect thereto. A washer **114** facilitates the rotative movement of lever **104** with respect to wedge **110**, and transfers the clamping force caused by the inward movement of the threaded relationship of nut **116** to shaft **108** into wedge **112**.

Thus, it is seen that rotation or pivotal action of string clamp head **24** occurs only when the proper tension on the string is achieved as determined by the adjusted position on compression spring **78**, and that when this proper tension is received lever **104** is released to clamp disc **62** in fixed position to plate **50** and thus lock arm **44** so that no further movement of assembly **20** can occur. After the tensioned string is held in position with one of the appropriate string clamps **26** or **28**, lever **104** can be manually rotated in a counter-clockwise direction against the tension of spring **106** to the catch position. In this situation, as seen in FIGURE 11, the bar **102** hits the lip **94***a* which causes the rotation of plate **94** around pin **96** against compression spring **100**. When lever **104** is pushed far enough to the left or in counter-clockwise direction the lip **94***a* springs down over the end of bar **102** by action of spring **100** so as to hold lever **104** in the upright position indicated in the drawings.

String clamp head

The clamp head **24** is best seen in FIGURES 4, 5, and 6 and comprises two outer plates **120** and **122** firmly bolted together in spaced relationship and pivotally mounted to the arm extending from plate **50** by the pin **70** passing through appropriate bearings **124** in each plate. The actuating bracket arm **72** is appropriately bolted to plate **120** as best seen in FIGURE 6. Two inner plates **126** and **128** are slidable relative to the fixed outer plates **120** and **122** as they glide on four rows of rolling balls, each indicated generally by numeral **130**. The balls **130** move in slanting receiving slots appropriately machined into the surfaces of the plates, and indicated generally by the dotted lines **132** in FIGURE 4. The balls **130** are held in the slots **132** by appropriate stops **133** secured by screws **135** to the ends of outer plates **120** and **122**, respectively. It should be noted that the slanting slots **132** are parallel to each other, but are slanted with respect to the plates, and hence are cut partly in the outer plates **120** and **122** and partially in the inner plates **126** and **128**. The plates **126** and **128** are biased apart towards plates **120** and **122**, respectively, by an appropriate spring **134** therebetween. It is thus seen that a movement of inner plates **126** and **128** in a direction indicated by an arrow **136** in FIGURE 4 will press the plates **126** and **128** together in a parallel motion by the action of the balls **130** rolling in slots **132**.

In order to limit the parallel movement of plates **126** and **128** together, a bracket **140** is mounted in fixed relationship to inner plate **126** by appropriate screws and carries a spring loaded adjustable screw **142** threadably received in the downward extension thereof. The end of the screw **142** is adapted to abut against the spacing block holding the outer plates **120** and **122** in fixed relationship to each other, thus limiting the sliding movement of inner plates **126** and **128** relative thereto, thereby automatically limiting the closing or clamping action of inner plates **126** and **128**. This adjustability prevents the clamp plates **126** and **128** from closing too far and injuring delicate strings. From the foregoing, it should be understood that when a string to be tensioned is laid between the plates **126** and **128**, they can be moved manually forward to automatically clamp the string, and the actual pulling of the string in the direction of arrow **136** in FIGURE 4 only serves to further clamp and firmly hold the string in position during the tensioning arrangement with the assembly **20** described above.

String clamps

One of the string clamps **26** and **28** is shown in detail in FIGURE 7. Specifically, such clamp comprises two clamp bars **150** and **152** which have slotted string clamping jaws **150***a* and **152***a*, respectively. A pair of steel plates **154**, preferably hardened, are attached to each side of the base of the bar **150**, and slidably engage a bar **156** mounted in slidable relationship to the frame **14**. These plates **154** are provided in spaced relationship to each other, as best seen in FIGURE 10, so that when tension is applied at the top of the clamp by engaging the string tensioned by the tensioning assembly **20**, the plate **150** tilts or rotates slightly thereby clamping plates **154** with a binding action onto bar **156** to prevent the entire clamp from sliding.

The remaining structure of the clamp includes an actuating lever **158** pivotally secured to connecting links **160** by suitable pin **162**. The links **160** pass through a slot **163** in bar **152** and are pivotally mounted by pin **164** to clamp bar **150**. A key **166** having a contoured cam like surface, indicated by the dotted line **168**, fits into the slot **163** in clamp bar **152** between the links **160**, as seen in FIGURE 7. The end of handle **158** has a mating engaging surface at **170** which is complementary to surface **168** of key **166**. A downward movement of handle **158** in a direction of arrow **172** will cause the handle and links **160** to move to the chain dotted line position thereby engaging the camming surface **170** of handle **158** against the camming surface **168** of key **166** to force the jaws **150***a* and **152***a* together against the normally opposed bias of a compression spring **174**. The camming surfaces **168** and **170** are also designed such that when the handle is down an imaginary line connecting pin **162** and pin **164** moves down below the camming surfaces **168** and **170** whereby the handle will remain down in a locked position, all as shown in the chain dotted line position of FIGURE 7. Therefore, it requires a manual effort to move the handle **158** back up to release the jaws from their locked position.

In order to provide an adjustability to the degree of

clamping by jaws **150***a* and **152***a* so as not to injure delicate string, the invention utilizes a screw **176** threadably received in clamp bar **152** which engages against the lower end of key **166** to control its spaced relationship with respect to the outer surface of clamp bar **152**. In other words, as screw **176** is turned inwardly, it forces the bottom edge of key **166** away from clamp bar **152** thereby causing the camming action to move jaws **150***a* and **152***a* closer together when handle **158** is moved downwardly to the locked chain dotted line position. In FIGURE 7, the jaws are set for their maximum width, and only an adjustment of screw **176** will move them closer together upon the movement of handle **158**.

String clamp bar

The details of bar **156** and its mounting relationship to frame **14** are best shown with respect to FIGURE 10 of the drawings. Specifically, the bar **156** has two roller bearings **180** mounted to one end which run in a groove **182** formed in the outside edge of the rail **14***b* of frame **14**. Another roller **184** is mounted to bar **156** to run on the inside surface of the rail **14***b* while still another roller **186** is mounted to the other end of bar **156** and rolls on a flat central cross frame **14***a* connecting between the substantially square outer rail **14***b* of frame **14**. The upper inner lip of rail **14***b* is cut away, as seen in FIGURE 10 so that the entire bar **156** can be rotated in a counterclockwise direction as viewed in FIGURE 10 to remove the bar from the rail **14***b*. This is necessary when switching the clamps from lengthwise to crosswise stringing as explained earlier. Also, it should be noted at this point that the plates **154** connected to clamp bar **150** are notched at **154***a* to allow removal of the clamps from bar **156**. This is accomplished by rotating the entire string clamp 90° from that position shown in FIGURE 10 on bar **156** so that the notches **154***a* will slide over the small bracket connecting rollers **186** and **156**.

Frame clamp

The sliding frame clamp **16** is illustrated in greater detail in FIGURES 8 and 9 of the drawings. The knob **42** operates through a shaft **200** threadably received in the upper end of an L-shaped flange **202**. A substantially rectangularly shaped clamping loop **204** is slidably received on shaft **200**. Loop **204** is forced down by the bottom end of shaft **200** resting in a conical notch in the inside edge of the bottom by the loop. It is biased relative to flange **202** by a suitable coiled spring **206**. The flange **202** has clamping tabs **208** and **210** firmly bolted thereto which have beveled surfaces adapted to mate with the opposed beveled surfaces of slide bar **32**, as best seen in FIGURES 8 and 9. A lower jaw **212** has tabs **216** and **218** firmly bolted or affixed thereto which also is firmly attached to flange **214** which ride on the opposed beveled surfaces of slide bar **32**. Thus, it should be understood that as loop **204** is crewed down by handle **42** onto the throat of the racket frame indicated by dotted lines in FIGURE 9, flange **202** is pulled upwardly while flange **214** is pushed downwardly each of which actions cause respective cocking thereof to force their respective tabs **208**, **210**, **216**, and **218** against the opposed sides of the beveled slide bar **32**. In other words, flange **202** tends to rotate slightly in a counter-clockwise direction as seen in FIGURE 8 while flange **214** tends to rotate slightly in a clockwise direction to achieve the desired binding, locking action of the entire clamp unit **16** onto slide bar **32**. Therefore, when the racket throat is tightened the clamp unit **16** is at the same time secured relative to the frame **14**.

While in accordance with the patent statutes only one best known embodiment of the invention has been illustrated and described in detail, it is to be particularly understood that the invention is not limited thereto or thereby, but the inventive scope is defined in the appended claims.

What is claimed is:

1. A device for stringing tennis rackets, and the like, comprising a base, an elongated tensioning arm mounted to the base, a substantially square and planar support frame mounted to the base, so as to be pivotal around the tensioning arm in a plane substantially parallel thereto, clamp means mounted to the support frame to hold a racket in fixed relation thereto, at least one string clamp carried on the frame and slidable substantially parallel to at least one edge thereof which is characterized by

a tension head carried in substantially longitudinal sliding relation on the tension arm,

a string clamp head mounted for limited pivotal movement to the tension head and adapted to clamp and hold a string to be tightened,

tension means normally biasing the string clamp head to one limit of its pivotal movement,

means to move the tension head along the tensioning arm to tighten a string held by the string clamp head, and

locking means actuated by a preselected amount of pivotal movement of the string clamp head toward its other limit to lock the tension head in fixed relation to the tensioning arm.

2. A device according to claim **1** where the tension means normally biasing the string clamp head is adjustable to thereby provide a fixed control to the amount of tension on the string to be tightened.

3. A device according to claim **1** where the string clamp head clamps onto the string to be tightened with an increasing clamping pressure as the string is further tensioned, but which includes means limiting the extent of the clamp to prevent crushing the string.

4. A device according to claim **1** where there are two clamp means and at least one of the clamp means is adjustable relative to the support frame to accommodate rackets of different size, and wherein clamping of the racket therein wedges such clamp means relative to the frame, and where the other clamp means is pivotally mounted to the frame so as to tip out of the way of a racket being positioned with respect to the frame.

5. A device according to claim **1** where there are two string clamps each adjustable to be slidable substantially parallel relative to any edge of the support frame and which clamps further include means limiting the extent of clamp to prevent crushing the string, and which locks when in clamped relation, and which includes lever means with a high mechanical advantage to accomplish clamping.

6. A device according to claim **1** where the means to move the tension head along the tension arm is a rack fixed to the arm and a gear engaging the rack rotatably mounted by the tension head, means to rotate the gear, and where the locking means comprises a latch unit mounted to the string clamp head, a biased locking lever normally retained by the latch unit, but released upon a predetermined pivotal movement of the string clamp head against its biased direction to lock the gear in nonrotatable relation to the tension head.

7. A device according to claim **5** where both string clamps are normally movable both parallel and transversely relative to any edge of the support frame, but when actuated to clamp a string under tension they are simultaneously locked relative to the frame in the direction of the tension on the string.

8. A device for stringing tennis rackets and the like comprising a base, a substantially planar support frame mounted to the base, an elongated tensioning arm mounted to the base whereby the frame and arm are pivoted with respect to each other in a plane substantially parallel thereto, clamp means mounted to the support frame to hold a racket in fixed relation thereto, at least one string clamp mounted on the frame but movable relative thereto which is characterized by

a tension head assembly carried in sliding relation on the tensioning arm,

a string clamp head mounted for limited pivotal movement to the tension head and adapted to clamp and hold a string to be tightened whereby tensioning of the string tends to cause pivotal movement of the clamp head to one limit of its pivotal movement,

means normally biasing the string clamp head to the other limit of its pivotal movement to oppose the tendency of the tensioning of the string to pivot the clamp head,

manually actuated means to slide the tension head along the tensioning arm to tension a string held by the string clamp head whereby pivotal movement of the clamp head toward said one limit is actuated, and

locking means mounted to the tension head assembly released by a preselected amount of pivotal movement of the string clamp head towards its one limit to lock the tension held in relation to the tensioning arm.

9. A device according to claim **8** where the means biasing the string clamp head is a helically coiled compression spring and whereby the amount of bias is controllable by adjustability of the compression of said spring.

10. A device according to claim **8** where the string clamp head comprises a pair of connected parallel spaced outer plates pivotally mounted to the tension head assembly, a pair of inner plates each normally biased towards its respective outer plate, where each inner and outer plate combination has at least one groove commonly aligned thereto which in effect is angled in relation to the parallel surfaces of the plates, ball means slidably received in the grooves whereby relative movement between the inner and outer plates is limited to a linear motion and the inner plates move in parallel relation toward each other upon a movement of the inner plates linearly in a predetermined direction, and adjustable stop means secured to one of the inner plates to engage any fixed portion of the clamp head to limit the linear movement of said inner plates in said predetermined direction.

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